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Miss M. E. Sinclair and Mr. C. Havemeyer have been appointed instructors in Mathematics in the University of Nebraska.

Dr. George H. Hallett has been promoted to an assistant professorship of Mathematics in the University of Pennsylvania.

Mr. N. R. Wilson, lecturer in Mathematics in Wesley College, Winnipeg, Manitoba, is doing advanced work at the University of Chicago.

Prof. T. E. Holgate of the department of Mathematics of Northwestern University, has been appointed acting President of the University.

Dr. E. M. Blake, instructor in Mathematics in the University of California, has accepted the chair of Mathematics in the University of Arizona.

Professor Vining of Brandon College, Brandon, Manitoba, has been granted a leave of absence for two years. His place is temporarily filled by Dr. H. E. Jordan.

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### BOOKS.

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*Lehrbuch der Differenzenrechnung* by D. Seliwanoff. B. G. Teubner, Leipzig, 1904. 92 pp.

At the request of the well known Leipzig publishers, B. G. Teubner, the author has elaborated his article on Finite Differences in the *Encyklopaedie der Mathematischen Wissenschaften*, Vol. 1, pp. 918-937, to the dimensions of a book. Thus, while the encyclopaedia gives but one page to the approximate evaluation of definite integrals and four pages to the subject of difference equations, the book devotes six pages to the former and twenty-nine pages to the latter. The gain in perspicuity over the encyclopaedia article is therefore considerable and indeed, although the author omits certain questions which might well be taken up, the subjects which he treats are presented in a delightfully clear and simple manner.

The books of Boole and Markoff are more complete, but this work of Seliwanoff should be regarded not as a handbook for one who is familiar with the subject, but as a text book for the beginner who desires to learn the *technique* of computation, such as the methods of interpolation, construction of tables, estimation of unavoidable errors.

Part I devotes thirty-two pages to the subject of Differences. After developing some of the most important general theorems in Chapter 1, the question of Interpolation is taken up in Chapter 2 where the author considers exact and approximate interpolation, computation of the roots of numerical equations, and the computation of logarithms and antilogarithms. The methods of evaluation of definite integrals in Chapter 3 are all very elementary, culminating with Simpson's Formula.

In Part II, Chapter 1 treats the subject of Indefinite and Definite Summation. According to the conventional usage the symbol  $\Sigma$  is employed as the Calculus analog of the sign of integration  $\int$ . In the opinion of the reviewer the symbol  $S$  would serve the purpose somewhat better. First, the use of the Greek letter as a functional symbol, where the (finite) integration is not possible, is a departure from its recognized meaning in various domains of analysis; second, the letter  $S$  corresponds somewhat closer to the

long s of the integral calculus, and third, the  $\Sigma$  would remain open to indicate a summation of integrals. Chapter 2 develops in an elementary manner the Jacob Bernoulli function  $\varphi_n(x) = \sum_0^x \frac{x^{n-1}}{(n-1)!}$ , and some of its properties. Chapters 3, 4 are devoted to the Euler formula

$$F(a) = \frac{1}{h} \int_a^{a+h} F(\mu) d\mu + A_1 [F(a+h) - F(a)] + A_2 h^2 F'(a + \theta h)$$

and to some of its important applications, such as the development of Sterling's formula

$$\lg(1.2.3.....x) = \lg \sqrt{(2\pi)} + (x + \frac{1}{2}) \lg x - x - A_2 \cdot \frac{1}{x} + A_4 \cdot \frac{2!}{x} + \dots$$

Part III takes up the subject of Difference Equations. In Chapter 1 the general equation

$$y_{x+n} = f(x, y_x, y_{x+1}, y_{x+2}, \dots, y_{x+n-1})$$

and the linear equation

$$y_{x+n} + p_1 y_{x+n-1} + p_2 y_{x+n-2} + \dots + p_{n-1} y_{x+1} + p_n y_x = Q_x$$

are discussed very briefly. The second chapter is devoted to the linear equation of the first order and to the interesting application of expanding  $\cos xt$  according to powers of  $\cos t$ . Chapter 3 treats in somewhat greater detail the linear difference equation with constant coefficients. Many of the questions of interest from the theoretical standpoint as well as in the higher applications, are not touched upon. We are indebted to the author for an excellent elementary text book on a fascinating and important subject. SAUL EPSTEIN.

*Versicherungsmathematik.* Von Alfred Loewy. Leipzig, Sammlung Götschen, 1903. 145 pp.

In publishing this book the Sammlung Götschen has certainly followed out successfully its expressed policy of giving to the public a brief, but clear and up-to-date development of one of the most interesting applications of mathematical theory. While the reader who is unacquainted with the subject of life insurance might find Professor Loewy's exposition somewhat too condensed, anyone with a knowledge of elementary algebra who has some acquaintance with the business aspect of the subject cannot fail to appreciate the value of this little pocket edition which contains in its 145 pages the development of all the important formula needed by the actuary.

While one recognizes at once the meaning of many of the words such as *Nettoprämie* = net premium, *Sterblichkeitstafel* = mortality table, the significance of some of the German expressions, of which a glossary of fourteen follows, is not at all evident. Indeed, a few are not to be found in the average German-English dictionary and their meaning must be learned from the context.

*Zinsfuß* = rate of interest.

*Zinsezin* = compound interest.

*Barwert* = present value.

*Seibrente* = annuity.

*Erlebensversicherung* = endowment.

*Postnumerando* = payable subsequently.

*Pränumerando* = payable in advance.

*Karenzeit* = period of deferred insurance (a policy payable at death, provided death is not within  $m$  years, is spoken of as a policy with  $m$ -jähriger *karenzeit*).

*Rückversicherung* = reinsurance.

*Bruttoprämie* = gross premium.

*Prämienrückgewähr* = return (of part or whole) of premium.

*Rückkaufpreis* = surrender value.

*Passiva* = liabilities.

*Aktiva* = assets.

Every time a conventional symbol is introduced its number (Roman) is printed in the margin, thus enabling the reader to find easily the meaning of the symbols in any formula under consideration. As might be expected, the notation is not that of the Actuarial Society of America; the author follows, with some exceptions, the Universal Standard Notation of the International Congress of Actuaries of 1895.

The fallacy involved in assessment life insurance is now well understood and Loewy therefore dismisses this subject with a brief and unfavorable mention.

On page 92 it is stated that a well known German company computes the gross premium  $A_x'$  of a one payment life policy by means of the formula  $A_x' = \frac{2}{20} A_x$ , where  $A_x$  = net premium. In America the "loading" is higher than this, but on the other hand life policies are "participating" and draw dividends.

In the case of entire life policies, yearly payments, the formula is  $P_x' = 1.24 P_x$  for ages exceeding 34 years, making a loading of 24%. In America the loading is sometimes less and sometimes more than this, varying with the different companies. For non-participating policies it is much less. It is not calculated as a percentage of the net premium however. In the case of half yearly payments the Germans add one per cent. of the yearly net premium; in case of quarterly payments two per cent. is added.

The American law requires an insurance company to have on hand at the end of the first year, when the expenses are heaviest, the full reserve according to a mortality table in which no account is taken of the gain due to selection by medical examination. The large and wealthy companies meet this requirement by a bookkeeping device, transferring from the surplus, enough to meet the legal requirements, to the first year's reserve. The smaller companies are compelled however to resort to the following plan: If the contract is for a twenty payment life policy, they issue a one year term policy, the regular insurance commencing one year later and extending over nineteen years. Actuaries are divided in opinion at present on the moral point involved in this device; although unjust from the technical point of view it is difficult to see how a new company could come into existence in any other way. The German law is more flexible, allowing the company to draw upon the first year's reserve, for expenses, to the extent of  $12\frac{1}{2}M.$  per thousand marks of insurance.

Experience shows that the Gompertz-Makeham formula gives the most satisfactory way of graduating mortality tables, and it is the method in general use at the present time. For this reason the reviewer regards the author's treatment as too brief and condensed. The mere statement of the result in the integrated form with the specification of the values of the constants is not sufficient for one who is reading it for the first time.

A very interesting feature of the book is the insight given by it into the conditions of German life which help one to understand why deferred temporary annuities and endowments are more popular in Germany than in America. The former are often purchased for the purpose of defraying the expenses of a son at the University. The latter, besides being a provision for old age, are also purchased for the purpose of providing a daughter with her "aussteuer" and a son with the expenses of the one year of military service. According to the German law those who pass the "secondär" examination and are willing to defray their own expenses are exempted from two of the required three years of service.

The book seems to be free from misprints and other errors. By careful condensation the author has reduced it to pocket size. It will be found a very useful little hand book.

SAUL EPSTEIN.

*Grammar School Algebra.* By David Eugene Smith, Ph. D., Professor of Mathematics in Teachers College, Columbia University, New York. 12mo. Cloth. vi + 154 pp. Price, 50 cents. Boston and Chicago: Ginn & Co.

This book introduces the student of Arithmetic to the mysteries of Algebra with ease and simplicity. It begins by showing the uses of Algebra by employing such practical applications as are within the range of the knowledge of the student. The work includes linear equations with two unknown quantities, and easy quadratics. Abundant oral and written exercises are provided.

B. F. F.

*Elements of the Differential and Integral Calculus*, with applications. By William Anthony Granville, Ph. D., Instructor in Mathematics in the Sheffield Scientific School of Yale University. 8vo. Semi-flexible Cloth, xiv + 462 pages. Price, \$2.50. Boston and Chicago: Ginn & Co.

This Calculus, based on the Method of Limits, is the first of a series of mathematical text books to be published by Ginn & Co., and to be edited by Percy F. Smith, Professor of Mathematics in the Sheffield Scientific School of Yale University.

The book is designed for the use of students in colleges and engineering schools. At the beginning of the book is given a large collection of elementary formulas from Algebra, Geometry, Trigonometry, and Analytical Geometry, serving to refresh the mind of the beginner with many of the implements with which his further progress is executed. Following the establishment of the fundamental principles, the utility of the Calculus is illustrated by numerous simple examples taken from Geometry and Mechanics. The figures throughout the book are excellent, and the typography is first class. B. F. F.

*Where Did Life Begin?* A brief inquiry as to the probable place of beginning and the natural courses of the migration therefrom of the Flora and Fauna of the Earth. A Monograph. By Gilbert H. Schribner. New Edition. 8vo. Cloth, xiii + 75 pages. New York: Charles Scribner's Sons.

In this little volume, the author puts forth the view and substantiates the same with fairly convincing argument that the beginning of all life occurred at the poles. The book first appeared in 1883. Since then, modern scientific research has greatly strengthened the argument herein contained. B. F. F.

*Lectures on the Calculus of Variations.* By Harris Hancock, Ph. D., Dr. Sc. (Paris), Professor of Mathematics in the University of Cincinnati. Large 8vo, Paper Cover, xvi + 292 pages.

In these lectures the author informs us that he has attempted to give a connected and simple treatment of Weierstrass' Theory of the Calculus of Variations. The student is introduced to the study of the subject by considering simple problems illustrating the connection between the Calculus of Variations and the Theory of Maxima and Minima.

The second part of the work beginning with Chapter XIII treats of the Theory of Relative Maxima and Minima in which the isoperimetrical problems are considered. This treatise constitutes a very important contribution to the literature of the subject. B. F. F.

*Text-book of General Physics for High Schools and Colleges.* By Joseph S. Ames, Ph. D., Professor of Physics and Director of the Physical Laboratory in the Johns Hopkins University. 8vo. Cloth, 768 pages. Price, \$3.50. New York, Cincinnati, and Chicago: The American Book Co.

This book is not a revision of the author's previous text book, entitled the *Theory of Physics*. It is an entirely new book containing scientific discussions of the most recent discoveries in Physics, and clear and logical statements of the theory and experimental facts upon which the science is based.

The book is divided into the following sections: Mechanics and Properties of Matter, Heat, Vibrations and Waves, Light, Magnetism and Electricity, and each subject is treated with the clearness, thoroughness, and scientific accuracy characteristic of Professor Ames' writing. B. F. F.

#### ERRATA.

Page 195, line 5 from bottom, for  $G_4$  read  $G_{24}$ .

Page 196, line 9, read  $a_0\beta_0 + a_1\beta_1 + a_0\beta_1 + a_1\beta_0 + a_0a_1 + \beta_0\beta_1 = b$ .

Page 196, line 11, for  $(\beta_1 + \beta_1)$  read  $(a_1 + \beta_1)$ .